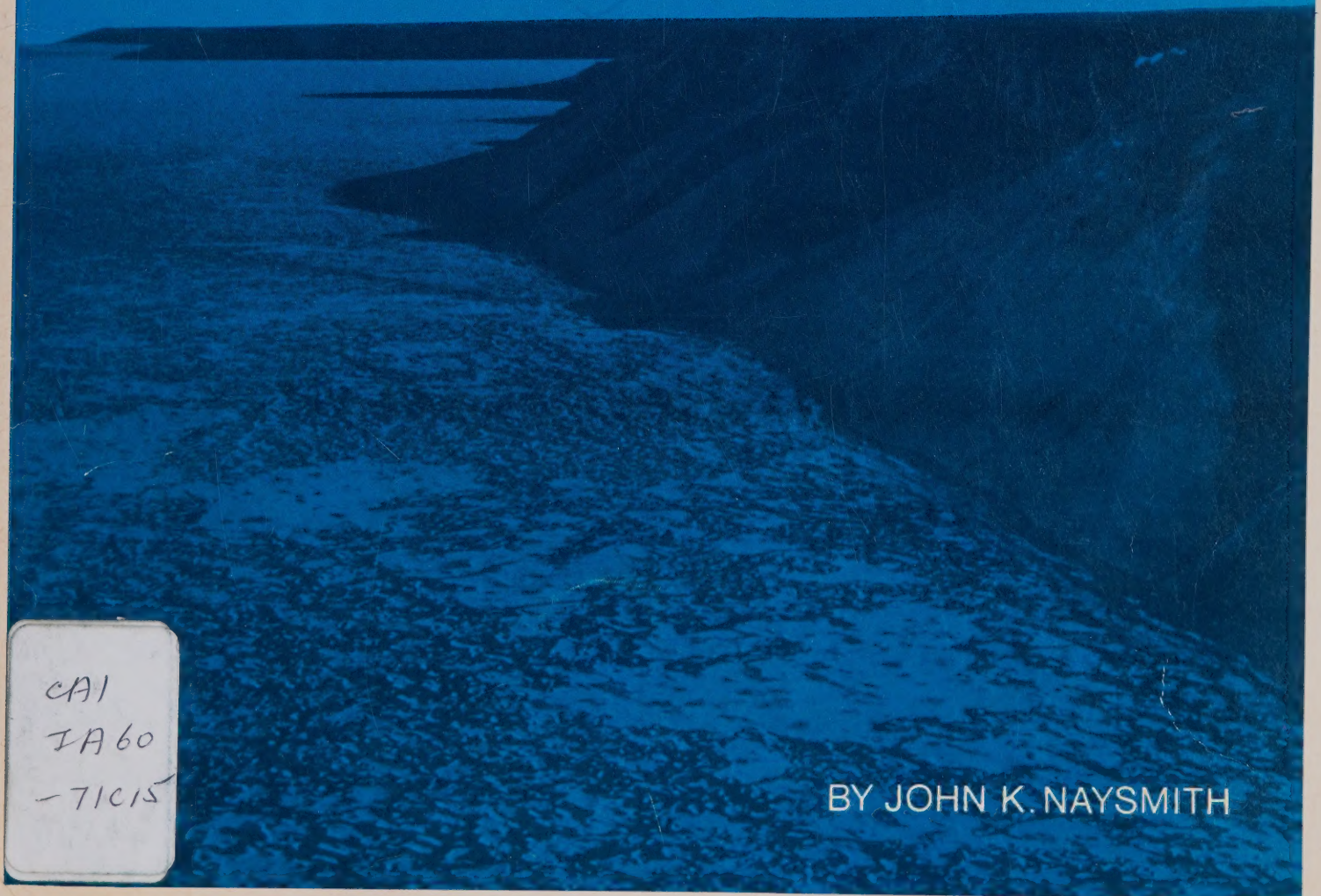
CANADA NORTH–

MAN AND THE LAND



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CANADA NORTH— MAN AND THE LAND

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PREFACE

A growing concern for the effects upon the natural environment of urbanization, industrialization and more intensive use of the natural resource-base has resulted in considerable public discussion and a proliferation of "environmental" legislation throughout the world. Canada's Act to Prevent Pollution to the Arctic Waters, Sweden's Environment Protection Act and Japan's Tokyo Metropolitan Environmental Pollution Control Ordinance are examples of legislation promulgated within the past two years which reflect government reaction to this public concern. In April of this year, *"Draft Principles of Water Legislation of the U.S.S.R. and the Union Republics"* were published in *Izvestia* and the republic newspapers for discussion by the public. In addition, activities, such as the United Nations conference on the "Human Environment" to be held in Sweden in 1972, will focus attention on some of the broader aspects of the question, such as global monitoring of pollution levels and international criteria and standards.

Perhaps there is now another force at work. I refer to a shifting sense of values which tends to bring into perspective the social implications of economic development and the importance of the natural environment to the well-being of the individual. Although this concept may come of age in the Seventies it cannot be regarded as an offspring of this decade. Recognition of the value of nature to the needs of man is not a phenomenon of the Space Age but indeed, as Professor Leo Marx[1] has pointed out, the conflict resulting from technological encroachment upon the natural scene was discussed in Western literature as early as 40 B.C.

The familiar urge to 'get away' — to leave a complex world (traditionally associated with the royal court and city) and begin a new life in a simpler environment (traditionally associated with the rural landscape) can be traced to the symbolic topography of Arcadia invented by Virgil.

Before the Renaissance, poets had seldom, if ever, thought of Arcadia as anything but a dreamland. But in Shakespeare's time, the symbolic landscape which for so long had been considered a mere poetic figure suddenly acquired a real geographic location by reference to the New World.

In America, by Jefferson's time, it had acquired political as well as geographical reality. When the authors of the Declaration of Independence rephrased John Locke's enumeration of the rights for whose protection government is instituted, replacing his 'life, liberty and property' with 'life, liberty and the pursuit of happiness,' they in effect transferred the ancient pastoral dream of human possibilities from its conventional literary context to an actual political context.

By Wordsworth's time, the natural landscape had become a repository for those ultimate values formerly attributed to the Christian deity. As Emerson put it, nature (which he usually represented by landscape images) had become for his generation 'the present expositor of the divine mind.' In America during the 19th century the image of a green garden, a rural society of peace and contentment, became a dominant emblem of national aspirations. Only the most astute grasped the contradiction between the kind of society that Americans said *they wanted and the kind they were actually creating.*

One of the principles suggested by literary pastoralism is the importance of diversity in physical settings — the need to preserve the distinctness of the three spheres of our environment: the city, the rural countryside, and the wilderness. Our literature supports the idea that each of these performs an important role in our psychic economy and that quite apart from nostalgia, sentiment, or any narrow measures of utility, either economic or recreational, each offers indispensable satisfactions.[2]

Plainly, the subject is not new. Nonetheless, it is probably accurate to say that at no other time has universal awareness of the natural environment been keener than it is today. For Canadians the recent advent of development in the Arctic and sub-Arctic regions has brought into focus the accompanying responsibility for minimizing those practices which have a detrimental effect upon the natural environment.

(1) Professor of English and American studies at Amherst College, Amherst, Mass.

(2) The foregoing passage is an extract from Professor Marx' paper, "Pastoral Ideals and City Troubles" which was delivered at the Smithsonian Institute's Annual Symposium, February 16-18, 1967, and is found on pp. 124-140 of the book *The Quality of Man's Environment,* Smithsonian Institution Press. 1968.

With the Canadian north as a backdrop I have suggested that of particular concern should be the effect upon the Arctic's indigenous population of intensive industrial utilization of the natural resource-base. Within this frame of reference, the reader is asked to scan the broad horizon of conservation which lies between restoration and preservation.

When immersed in a particular program it is not always easy to stand back and commit to paper the basic issues involved. This self-imposed exercise was made easier recently when, for purposes of delivering a lecture at the University of Toronto[3] and addressing a NATO group visiting Canada, it was necessary to present in a more rigorous form some aspects of our approach to the problem. This work is based in part on those papers.

My own bias is that the value to be derived from one's awareness of the inherent order of nature cannot be overemphasized. In using as a case study the village of Old Crow I have attempted to give this bias a tangible form. Hopefully it will become apparent that there is a quality of the natural environment which gives rise to a value that is at a point beyond the material and recreational values that we can more readily identify. I have called this quality "the perceptive need of mankind."

It would be presumptuous to assume that the approach described represents a total solution, but I hope that it will prove to be an effective mechanism for mitigating the degree of disturbance both to people and to land, apparently inherent in resource utilization.

During the preparation of this paper several friends read earlier drafts and gave me wise counsel. In particular, I am indebted to Professors R. J. Mackay and J. H. G. Smith of the University of British Columbia, Professors D. V. Love and G. D. Quirin of the University of Toronto and Mr. A. B. Yates, Department of Indian Affairs and Northern Development. As they have not seen this version of the paper, they are not responsible for its contents.

John K. Naysmith

Co. Papineau, P.Q.
September, 1970.

[3] "Natural Resources and their Management." Sponsored by the University of Toronto Division of Extension and the Ontario Forestry Association.

THE NATURAL SETTING

The wisdom in nature is distinguished from that in man by the coinstantaneity of the plan and the execution; the thought and the product are one, or are given at once, . . .

— Samuel Taylor Coleridge, "On Poesy or Art". 1818.

Conservation spectrum

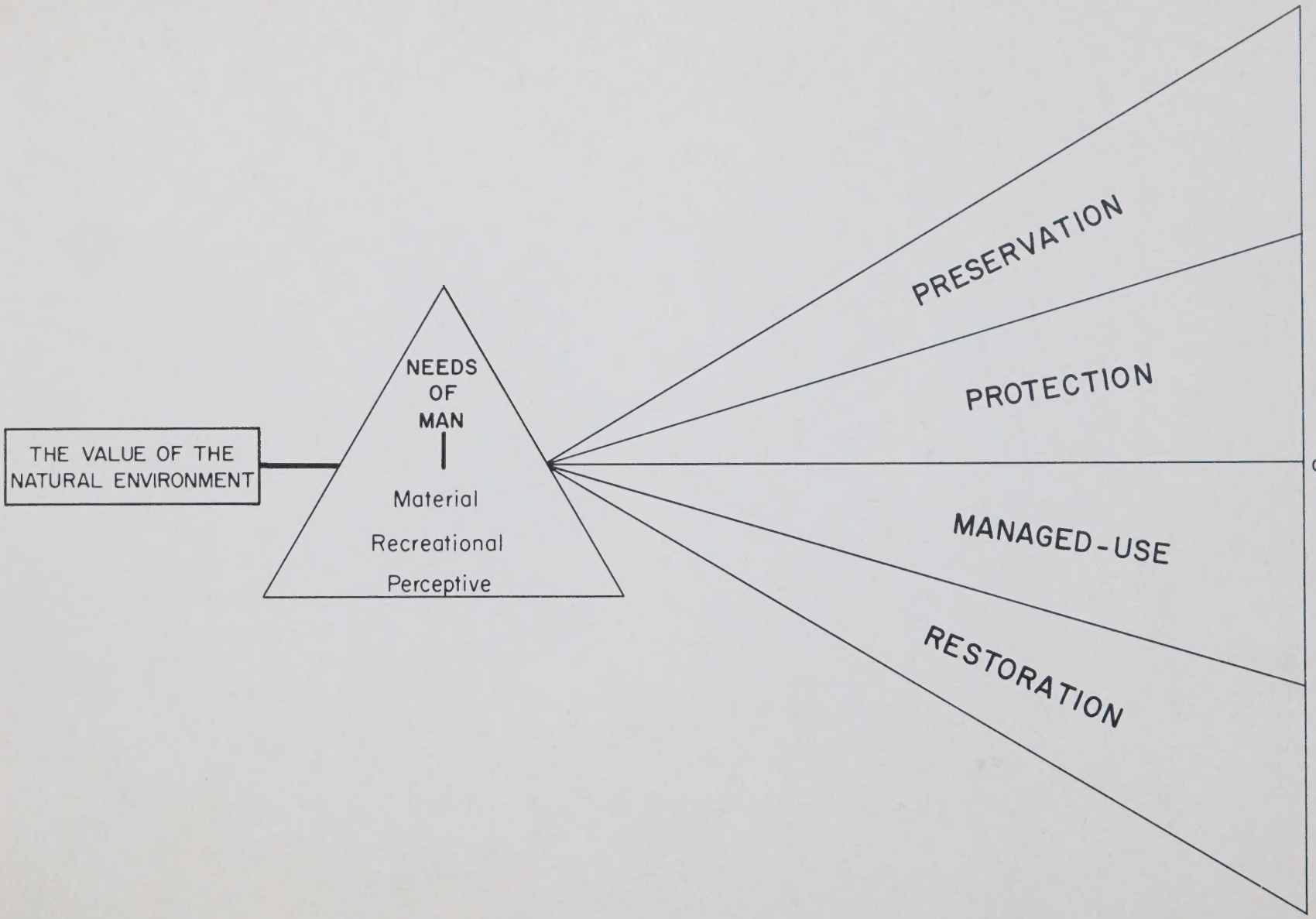


Figure 1

CONSERVATION. WHAT IS IT?

A well-founded conservation program must be based upon a package of environmental legislation which goes beyond the simple consideration of the various natural elements of air, land and water. Rather, the legislative base must contain principles which reflect the real value of the natural environment expressed as the needs of mankind. These needs can be broken down into three categories: material, recreational and perceptive.

If one considers, as in Figure 1, the value of the natural environment to be a beam of light passing through a prism comprising the three needs of mankind, the spectrum thus formed consists of four elements. These four elements, preservation, protection, managed-use and restoration, may be considered the principal components of conservation. The concept of conservation thus conceived it is then necessary to reconcile man's needs in terms of those elements. It is this reconciliation which provides the guidelines for developing a solid and practicable legislative base.

Elements	Guidelines
Preservation	designate areas for recreation, aesthetic, historic, wildlife, archaeological, scientific purposes.
Protection	maintain quality of the biosystem to prevent degradation of life-sustaining elements.
Managed-use	minimize disturbance to the resource-base as a result of industrial utilization.
Restoration	reclaim the resource-base following natural or man-made disturbances.

From the nature of the guidelines it is evident that no single piece of legislation will encompass all the elements. It is also apparent that none of man's needs can be met by legislation covering just one of the elements. For example, material needs require consideration of the guidelines encompassing the restoration, managed-use and protection elements. Similarily legislation, if it is to be sensitive to man's perceptive needs, must be based on all four guidelines.

Having discussed the process by which an environmental program can be designed let us address the question of mankind's needs.

With respect to material requirements if we consider the environment to mean all of the renewable and non-renewable resources then its value to man needs little discussion. To a large degree economic development is based upon increasing utilization of the resource-base and, in the process, society becomes progressively more dependent upon the extractive industries for its material comfort.

There is the even more direct relationship existing between the land and the native people who derive a livelihood from hunting and trapping.

While economic growth and natural resource utilization have become synonymous there has been a growing awareness of the inherent recreational value of the natural setting. More leisure time, greater mobility, higher incomes and increasing urban tension have resulted in a growing use of land and water for recreational pursuits.

The third category, perceptive needs, is a consideration of the requirements of man beyond the physical. The mental well-being of the individual is assured to some extent by the recognition of the aesthetic quality inherent in the natural environment. More than this, however, there is also the uplifting influence emanating from the natural setting and the knowledge that it does exist.[1] This growing awareness is a manifestation of a shifting sense of values that is apparently correlated with the increasing impact of technology upon the natural environment.

Turning to the conservation spectrum and the guidelines for legislation we derive the following.

At one end of the spectrum are the elements of *managed-use* and *restoration* of the resource-base. Here the emphasis is on utilization but under conditions which minimize the disturbance of other resources during the harvesting and processing phases. For example, where land or water is needed in order to carry out an industrial operation, regulatory controls can be imposed upon the user as conditions for acquiring the rights to

[1] The degree of influence is an interesting point here. For example, a southern Canadian would probably respond in a way quite different from that of an Eskimo to the broad expanse of the barren lands.

the use of land or water.[2] The object is to minimize disturbance to the resource-base while accepting the fact that if the natural resources are used, some degree of disturbance is unavoidable.

The next element in the conservation spectrum is the *protection* of the biosystem to safeguard the future material needs of mankind. Here it is a question of maintaining the quality of the environment in the interests of self-preservation. Unlike the element of managed-use where some degree of disurbance is acceptable, here the emphasis is on prevention.[3] With the *protection* element of conservation, the object is the elimination of the possibility of irremediable degradation of the environment because of the serious consequences which would arise from a failure to achieve that goal. Included in this category would be pollution of the seas by toxic materials which could effectively eliminate marine plant and animal life. In this instance, legislation must be of a preventive nature calling for high standards of ship construction and marine technology.

The fourth element of conservation is the *preservation* of particular segments of the resource-base. Here the question is one of preserving areas of unique aesthetic and recreational value. With increasing industrial use of the natural resources, this element of the spectrum must be a dynamic one. Although the other elements tend to mitigate the detrimental effects of resource use, the preservation element must be a positive force in maintaining, through parks and wilderness areas, the intrinsic values of the land for the well-being of the individual.

To complete the conservation spectrum, and as an adjunct to the *preservation* element, there is the need to allocate particular areas as being of historic and archaeological importance and other areas for purposes of scientific research. Such areas, although relatively small, should be maintained in an unmodified state. An example of this aspect of conservation would be the areas of ecological uniqueness designated by the International Biological Program.

[2] For an example of this kind of legislation, see Appendix A. The Northern Inland Waters Act.

[3] An example of this type of legislation is Canada's Arctic Waters Pollution Prevention Act.

CANADA'S NORTH

The People

Archaeological sites in the Yukon indicate that the first humans in Canada were located in that region at least 7,000 years ago. For several thousand years prior to the white man's arrival the Indians and Eskimos who inhabited the regions now known as the Yukon and Northwest Territories evolved and maintained successful cultures of seasonal nomadism based on hunting and fishing.

The Eskimos, with the exception of a group in the interior of the Northwest Territories, had developed a primarily coastal culture. There are no Eskimo communities on the short Arctic Coast (about 135 miles — 220 kilometres) of the Yukon Territory today but archaeological remains show that it too once supported a fairly substantial Eskimo population. The Eskimos divided into small family groups and moved with the game resources of the region. They hunted mainly in the coastal areas, but occasionally made trips to the tree-line to cut wood for sledge runners, tools and implements.

The Indians lived in small bands roaming the boreal forest and sub-Arctic forest regions for game and fish. Some groups did travel northward into the tundra during summer and fall to hunt caribou, occasionally going as far as the Arctic Coast. Although their hunting areas were adjacent and their way of life similar, the Indians and Eskimos remained apart. There was little cultural exchange and no intermarriage between the two races.

The European explorers of the 16th, 17th and 18th centuries were the first white men to contact the Indians and the Eskimos. The explorers were followed by whalers, fur traders (who had considerable impact upon the natives' traditional way of life), prospectors, missionaries, pioneer settlers and detachments of what is now the Royal Canadian Mounted Police. Small settlements grew along the main waterways and introduced a new way of life to the North.

In 1670, Charles II of England granted to a company that was to become the Hudson's Bay Company a Royal Charter encompassing substantially all of what is now northern and western Canada. The area, known as Ruperts Land (named after Prince Rupert, the first Governor of the Company) was held by the Company for nearly 200 years before a parliamentary committee recommended that the Company should relinquish its

charter to the British Crown. In 1869, negotiations with the Company were concluded and, in 1870, Ruperts Land and the Northwest Territory (that portion of the Company's holdings the water of which did not drain to Hudson Bay) were added to the Canadian Dominion. Ten years later the Arctic Islands were transferred by Britain to the Dominion of Canada. In 1825, the British and Russian governments had signed the St. Petersburgh Treaty which recognized the 141st meridian of west longitude (the present Yukon – Alaska boundary) as the boundary between their respective territories.

Gold was discovered in the Klondike in 1896 and the Yukon Territory was created in 1898. By 1912 all of the lands south of the sixtieth parallel and south of Hudson Strait were ceded to the present provinces, and the two federal territories, called the Yukon and Northwest Territories, acquired the boundaries which have remained unchanged.

By 1900, the total population of the Yukon was over 27,000 and of this total about 3,000 were Indians. Nearly all of the 24,000 whites were concentrated in the vicinity of Dawson City and in search of gold. When the boundaries of the Northwest Territories were set in 1912 the population was just over 6,000 persons almost all of whom were Indians and Eskimos. Populations have risen slowly but steadily in the Northwest Territories, whereas the Yukon population dropped to 4,000 in 1921 and has been rising slowly since. Today, the combined population of the Yukon and Northwest Territories is 50,000 including about 20,000 Indians and Eskimos.

Geography

The Yukon and Northwest Territories comprise nearly 40 per cent of the total area of Canada covering 207,000 square miles (536,000 square kilometres) in the Yukon and 1,253,000 square miles (3,245,000 square kilometres) in the Northwest Territories. For the purposes of comparison, the area of the Yukon Territory is equal to that of France and the area of the Northwest Territories to that of India.

Stretching from the Atlantic Ocean on the east to within a few miles of the Pacific Ocean on the west, the Canadian north is an immense region of great contrasts. This is a salient fact in any attempt to develop regulatory control over the use of the land surface. Westward the Yukon is a rugged land of plateaus and mountains cut off from the Pacific by the Coast and St. Elias Ranges which form a natural barrier to maritime influences from the Pacific. The mountains of the Yukon form the northern part of the Cordilleran Region of North America. Mount Logan, in the south-western Yukon at 19,850 feet (6,054 metres) is Canada's highest mountain. To the east, the Mackenzie Mountains, with ridges of about 8,000 feet (2,500 metres), provide a physical barrier separating the Yukon from the Northwest Territories. The mainland of the Northwest Territories consists of two major geological regions, the Interior Plains, and the Precambrian Shield on the east. These plains, a continuation of the Great Plains that stretch from the Gulf of Mexico northward, are dominated by the Mackenzie River which flows out of Great Slave Lake northward to the Beaufort Sea, a distance of about 1,100 miles (1,800 kilometres).

The Precambrian Shield, consisting of 700,000 square miles (1,813,000 square kilometres) of bedrock, mostly granite, extends from Great Bear and Great Slave Lakes in the west to Baffin Island in the east. Except for the rugged mountains of the eastern islands, the height of the Shield rarely exceeds more than a few hundred feet.

In the eastern Arctic Islands the Precambrian rocks form a spine of mountains from Baffin to Ellesmere Island which rise to heights of 10,000 feet (3,000 metres) with spectacular vertical cliffs and deep fiords along their eastern coasts. Glaciers are found in the higher altitudes. At the extreme northwest and fronting the polar basin, is a thin shelf of sedimentary rock that makes up the Arctic Coastal Plain.

Climate

For the most part the climate of the Territories can be described as dry and cold. Although maximum summer temperatures are similar to those in areas to the south, Dawson in the Yukon Territory has recorded a temperature of 95 degree F. (35 degrees C), the January mean temperature for Dawson is –16 degrees F. (–26.7 degrees C) and for Melville Island in the Arctic Islands it is –35 degrees F. (–37.2 degrees C).

Precipitation in the Territories is light, ranging from 9 to 17 inches (228 to 432 millimetres) in the Yukon and

from 9 to 15 inches (228 to 381 millimetres) in the Mackenzie Basin. Annual snowfall in the sub-Arctic region (i.e., generally southward from the tree-line) is about 50 inches (127 centimetres); in the Arctic region, it is less than 30 inches (76 centimetres) annually. The greatest amount of precipitation in the barrens falls in the summer and early autumn. Snow covers the ground for almost eight months of the year with the greatest snowfall in October and November. The Arctic Archipelago is one of the driest regions in the world. The annual total precipitation over the islands north of the Parry group averages less than 5 inches (127 millimetres) with Fosheim peninsula on Ellesmere Island having an average of 2.5 inches (64 millimetres) annually.

Forest Cover

As might be expected only a relatively small portion of the Yukon and Northwest Territories is tree covered. The boreal forest region as classified by Rowe[4] covers the lower third of the Yukon Territory and extends eastward into the Northwest Territories as far as the Slave River and north to Great Slave Lake. See Map No. 1.

In the Yukon Territory, white spruce *Picea glauca* (Moench) Voss and lodgepole pine *Pinus contorta* Dougl. are the most prevalent coniferous species. Mixed stands include trembling aspen *Populus tremuloides* Michx. balsam poplar *Populus balsamifera* L. and white birch *Betula papyrifera* Marsh. with the spruce and pine. At the higher altitudes alpine fir *Abies lasiocarpa* (Hook.) Nutt is found; the absolute timber line varies between 4,000 and 5,000 feet (1,200 and 1,500 metres) depending on latitude. The balance of the Yukon consists of alpine tundra and transitional sub-Arctic forest tundra.

In the Northwest Territories the southwestern section of the Mackenzie Valley is mainly forested. In the Lower Liard watershed white spruce forms dense stands on the sites adjacent to the main river and tributaries while black spruce *Picea mariana* (Mill.) B.S.P. and larch *Larix laricina* (Du Roi) K. Koch dominate the poorly drained muskeg terrain. Eastward toward the Slave River jackpine *Pinus banksiana* Lamb. is predominant on the sandy sites. North of Fort Smith and extending to Fort Simpson on the Upper Mackenzie prairie-like patches of grasslands are found.

North and east of Great Slave Lake the density of trees decreases and they become stunted in growth. In this sub-Arctic forest tundra region there is some white spruce but generally the area is characterized by poorly drained sites supporting black spruce, larch and sphagnum moss.

North and east of the tree-line, which extends diagonally from the Mackenzie Delta south-east past the east end of Great Slave Lake there is a vast expanse of treeless tundra.

The far north is a veritable desert, particularly in the northwestern part of the Arctic Islands (the eastern side of the Arctic Islands is glacier covered). Because of low summer temperatures and virtually no rainfall, plants and grasses grow only in the most favourable locations.

[4] J. S. Rowe, *Forest Regions of Canada.* Northern Affairs and Natural Resources. Bulletin No. 123.


NATURAL VEGETATION
SCALE OF MILES
100 0 100 200 300
LEGEND
Boreal Forest
Alpine Tundra
Subarctic Forest Tundra Transition
Dwarf Shrub-Sedge-Moss-Lichen-Heath
Stony Sedge-Moss-Lichen-Tundra
Rock Desert or Fell-field
Existing Glaciers

Map 1.

Map 2.

CLIMATIC REGIONS
SCALE OF MILES
0
100
200
300
LEGEND
TUNDRA
SUB ARCTIC
CONTINUOUS
DISCONTINUOUS
CLIMATIC DIVISION
PERMAFROST DIVISION
GLACIER
Tundra
Sub-Arctic
Continuous
Discontinuous
Climatic
Climatic
Region
Region
Permafrost
Permafrost

Permafrost

Permafrost is that part of the earth's crust which remains below 32 degrees F (0 degrees C) continuously. The term describes only the thermal condition of the ground, not its composition which may be bedrock, gravel, sand, silt, clay or muskeg, singly or in combination. See Map No. 2.

The ground in permafrost areas is normally thought of as two distinct layers: the upper or active layer – usually one to three feet thick – which alternately freezes and thaws with the seasons; and the lower or permafrost layer which remains frozen continuously.

The permafrost layer may vary in depth from tens of feet to more than one thousand feet (a few metres to more than 300 metres) e.g., Resolute Bay, Cornwallis Island – 1,200 feet (350 metres) and Melville Island – 1,500 feet (450 metres). Melting of permafrost containing large quantities of ice gives rise to the major construction and land surface problems that are inherent in permafrost areas. Knowledge of the ice content of frozen soil is of major importance because it provides a measure of the extent to which subsidence or thermokarst topography will develop due to disturbance of the insulating layer. Materials such as rock, gravel or coarse sand usually contain little excess ice and thus impose few problems.

Much of the Territories, however, is underlain by finegrained soils such as the pleistocene and recent deposits along the Arctic Coastal Plain and inland deposits of glacial and post-glacial origin. Such soils generally have a high ice content so that excess water is released if thawing occurs. If extensive subsidence is to be avoided in such soils they must not be subjected to conditions conducive to thawing. This is a difficult proposition in view of the extreme sensitivity of permafrost to temperature differences.

In undisturbed areas of permafrost, a delicate condition of temperature equilibrium exists between the top of the permafrost and the ground surface. Any changes in the natural insulating cover, such as the stripping of moss, can upset this thermal balance and start the permafrost thawing. For example, one passage of a tracked vehicle over the ground surface can reduce the insulating value of the moss cover sufficiently to cause thawing.

A QUESTION OF USE

Values spring from the immediate and inexplicable reaction of vital impulse, and from the irrational part of our natures.

Santayana, "The Sense of Beauty".

ECONOMIC DEVELOPMENT

It has been said that the Yukon and Northwest Territories can be compared to a "less developed country" even though they are an integral part of a well developed political and economic system. To test this viewpoint it will be of some value to compare the economic structure of the less developed countries with that of the Territories.

J. Kenneth Galbraith[1] tackled the question of economic growth in various areas of the world by breaking the less developed countries into three distinct categories. He related this system of classification to particular goals and suggested what must be done within each country to pursue these goals. His approach becomes a highly normative study based on the principal obstacles inhibiting development.

He described Model I countries as those suffering neither from population pressures nor from a dearth of natural resources, but from a shortage of people capable of administering capital. Such countries as some of those in tropical Africa require basic technology and an infrastructure of trained people. The problem is not the scarcity of national capital per se but the shortage of trained people, the absence of elements of organization which can provide training and the lack of political organization.

Model II countries, such as some of those in Latin America and the oil-rich countries of the Middle-East, are similar to Model I countries in that they do not suffer from over-population or lack of adequate natural resources. However, Model II countries do have a poor but not insignificant education system, and political institutions and government organizations do exist. Here the chief obstacle to economic development is the distribution of income. For example, Iraq accrues several million dollars each year from oil royalties but this makes very little difference to the modal income of the population. By the same token, because of the land tenure system in Latin America a large portion of the population lives far below the subsistence level, whereas a minority, many of whom are absentee landowners, reaps the benefits produced by tenant farmers. Thus it is obvious that addressing the question of deficiences in infrastructures of government institutions will miss the mark. Until a more equitable distribution of income and a reduction in the amount of non-functional income accruing to the landowner is realized, these countries will have little opportunity for economic growth.

Model III countries are characterized by large populations that are increasing too rapidly in relation to the immediately available physical resources. Included in this group are India and Pakistan. Common to these countries is a low rate of savings as a result of very low incomes. The prime obstacle to economic development is shortage of capital. Since it is virtually impossible to generate capital from within these countries the object is to develop external supplies. This new capital, when it is properly utilized, results either in increasing the capacity of the land or in increasing the amount of land being utilized. In either case, per capita income increases and with it, the possibility for increased investment.

The differences between the Territories' situation and all three Models indicate that perhaps a fourth Model is required.

It is apparent that unlike Model I countries where no amount of capital input is beneficial, due to a shortage of people capable of managing it, and unlike Model II countries where a maldistribution of income and land tenure system precludes any realization of advantages capital might have, the Territories are structurally equipped to take advantage of available capital for investment purposes. The situation more closely resembles that of the Model III countries, where adequate social overhead, expertise and the elements necessary to produce managerial talent do exist but where the capacity to generate investment capital internally is low. It would seem that this lack of local capital for investment purposes makes the economic structure of the Territories resemble Galbraith's Model III more closely than either of the other two.

As we shall see in the next section of this chapter, the Yukon and Northwest Territories have a vast natural resource-base upon which to develop a significant industrial sector. In order to develop this potential wealth large capital expenditures are required to provide the necessary infrastructure and transportation facilities. In addition to financing by the public sector,

[1] From an unpublished lecture series. Harvard University. 1968.

large sums of capital are required from the private sector to develop the industrial base.

Although the population is sparse even by North American standards with one person for every 34 square miles (1 person/87 square kilometres) there is evidence to the effect that some segments of the Indian-Eskimo population now live very close to the productive capacity of the land. I will elaborate upon this point later when discussing the hunting and trapping economy of the Old Crow Indians.

Thus, while economic development of the Territories is basically dependent upon the use of the oil, gas and mineral resources, it must be recognized that northern peoples and particularly the Indians and Eskimos have needs which may not necessarily be met by the development of a viable industrial base.

INDUSTRIAL EXPANSION

Prior to the mid-60's, natural resource utilization in the two Territories was confined primarily to the production of gold and silver. Since 1965, resource exploration, development and production have undergone remarkable expansion. Lead, zinc, copper and asbestos are now being produced, oil has been discovered at Atkinson Point and forestry operations are moving into the southern Yukon.

Oil and Gas[2]

Oil and gas exploration permits in effect in the Yukon and Northwest Territories at January 1, 1970, covered approximately 439 million acres (178 million hectares). This is more than double the 1968 figure and represents an increase of 350 million acres (142 million hectares) in six years.

Expenditures for oil and gas exploration in 1969 were in the order of $56 million of which nearly one-half was spent on geophysical exploration. During the same year, exploration activity included 120 geological crew months and 160 seismic crew months. In 1967 the figures for corresponding activities were 35 and 60 crew months respectively. In terms of miles of seismic lines the 1968 figure was 4,000 miles (6,500 kilometres); the total mileage in 1970 may exceed 8,000 miles (13,000 kilometres).

Fifty-six exploratory wells were drilled in 1969 compared with 18 in 1964. The total number of wells drilled to date north of the 60th latitude is 501. Significant as these figures may be, compared to other parts of Canada, the Territories, from the standpoint of oil and gas, are virtually unexplored. Since 1947, generally considered to be the beginning of the modern era for oil and gas exploration in western Canada, there has been one exploratory well drilled for every 1,400 square miles (3,600 square kilometres) of sedimentary area on the mainland north of the 60th Parallel. In the Arctic Islands, the exploratory drilling density is one well for every 60,000 square miles (155,000 square kilometres): a contrast to the western provinces where the density of exploratory drilling is one well for every 40 square miles (100 square kilometres).

Only one oil field, at Norman Wells on the Mackenzie River, is under production in the Territories. It has produced about 12 million barrels (1.9 million cubic metres) since coming into production prior to the second World War: current estimates indicate 48 million barrels (7.5 million cubic metres) of additional recoverable oil. In January 1970, oil was discovered at Atkinson Point east of the Mackenzie Delta and in addition approximately twelve separate gas finds have been recorded.

Mining[3]

Traditionally, mining activity in the north has been centred in the Yukon Territory and the Great Slave Lake region of the Northwest Territories. However, 1969 saw the granting of 103 Prospecting Permits giving rights to several mining companies to explore for minerals on approximately 18 million acres in the eastern Mackenzie, Keewatin and Franklin Districts. The fact that in 1968 and 1969, 52,000 and 35,000 mining claims, respectively were recorded in the two Territories compared with 6,000 just five years ago is further evidence of the expansion of mining interest in the north.

[2] *Oil and Gas, North of 60.* Edition No. 6. Department of Indian Affairs and Northern Development. 1969.

[3] *Mining Activities North of 60. 1969.* Ottawa: Department of Indian Affairs and Northern Development.

In terms of production the Territories have become the largest source of lead and zinc in Canada. The Anvil Mine in the Yukon Territory and Pine Point Mines Ltd. in the Northwest Territories have a combined milling rate of approximately 16,000 tons per day. It is expected that when Anvil reaches its full milling capacity the annual value of lead-zinc production in the Territories will exceed $140,000,000.

Mineral production in the Northwest Territories in 1969 was valued at $115,446,000 and in the Yukon Territory at $37,656,000. This represents an 11 per cent increase over figures for 1968.

Forestry

The industrial utilization of the northern forests has been relatively small in comparison to non-renewable resource development. Much of the Yukon Territory and the Mackenzie District of the Northwest Territories supports tree growth, although only a small portion of the area contains merchantable timber. The productive forest area of the Territories covers approximately 70,000 square miles (180,000 square kilometres) and supports an estimated 25 billion cubic feet (700 million cubic metres) of timber.

It is estimated that the softwood allowable cut for the Territories could exceed 40 million cubic feet (1.1 million cubic metres) annually, but full development of this potential will depend upon the establishment of economic markets and transportation facilities. Also, a large proportion of this annual cut is made up of small-diameter wood suitable only for pulp or other fibre processes.

In recent years there has been an increase in the number and size of forest operations in the Territories and the demand for timber is continuing to increase, but production has been geared to supply limited local markets only, with a portion of the territorial requirement being supplied from the provinces. At the time of writing, 1969/70 total timber production was approximately 5 million cubic feet (140 thousand cubic metres); including sawlogs, mine timbers and fuel wood. As a result of the relatively small population in the north, local timber consumption is small in comparison to the size of the forest resource and it is likely to be no more than 6 to 8 million cubic feet (170 to 230 thousand cubic metres) annually for the next ten years. Present sawmill capacity is 12 million cubic feet (350 thousand cubic metres), although none of the present mills is operating at full capacity. However, a number of forest industry firms are showing serious interest in northern forest development and within the next few years production for the export market is expected to increase substantially.

CERTAIN EXTERNALITIES

This marked increase in industrial activity and exploration has brought with it a correspondingly marked increase in public concern about the natural environment. What is the effect of removing the vegetative layer of insulation in areas of continuous permafrost? To what degree are drainage patterns changed by the movement of vehicles over tundra? What is the capacity of Arctic fresh-water systems to assimilate wastes? Does the removal of forest cover in areas of discontinuous permafrost affect water quality and what of the regenerative potential of such forest lands?

Even more important is the fact that the development of the resource-base by the industrial sector can have a direct impact upon the indigenous people at the expense of their capacity to gain a satisfactory livelihood from the land. The loss of fur-bearing game habitat through the disruption of drainage patterns or the alteration of caribou migration routes as a result of land subsidence or large-scale obstruction could be disastrous to certain Arctic communities.

As long as the land is used by the indigenous population only for purposes of gaining food and shelter a balance tends to exist between the intensity of land-use and the natural but not unlimited regenerative capacity of the land. But by intensifying the use of the land surface for purposes other than hunting and trapping, the land's capacity to remain in balance could be overtaxed and result in adverse alteration of the land surface.

In discussing the use of lands for agricultural purposes by the indigenous population in tropical Africa, Firey[4] referred to the ecological, ethnological and economic constraints placed on the use of the resource-base. He proposed that from an ecological point of view

[4] Firey, W. I. *Man, Mind and Land, the Theory of Resource Use.* Glencoe, Ill.: Free Press, 1960.

man must utilize natural resources within the limitations that have been placed on them by nature. It is possible to exceed certain productive limitations for short periods with little if any harmful effect to the intrinsic qualities of the resource, but unduly prolonged abuse of these limitations will inevitably be at the expense of the resource's productive capacity. Consideration of the ethnological element brings into perspective those features which may or may not be acceptable due to the particular cultural characteristics of the user. Finally, there is the economic consideration. The proposal may fall well within the limits of both the ecological and ethnological factors but may or may not be economically feasible. Each constraint therefore further reduces the area within which resource development may be conducted.

The cross-hatched area in Figure 2 enclosed by the lines A and N represent that portion of the total resource-base which is actually utilized.

Consider the cross-hatched area in Figure 2 as representing the intensity of land-use in the tundra region by the native population prior to major development of the natural resources. The economic and ethnic constraints inherent in an indigenous culture tend to minimize the degree to which the resource-base (in this case the surface of the land) is used and hence reduce the impact upon the ecosystem.

Firey illustrated his theory as shown in Figure 2.

R = resource-base (e.g., land surface)

P = resource processes that are possible in given organic and physical environment

G = resource processes that are gainful for a number of the population

A = resource processes that are adoptable by given population

N = resource processes which are naturally possible

E = resource processes which are efficient for the population

C = resource processes which are culturally available

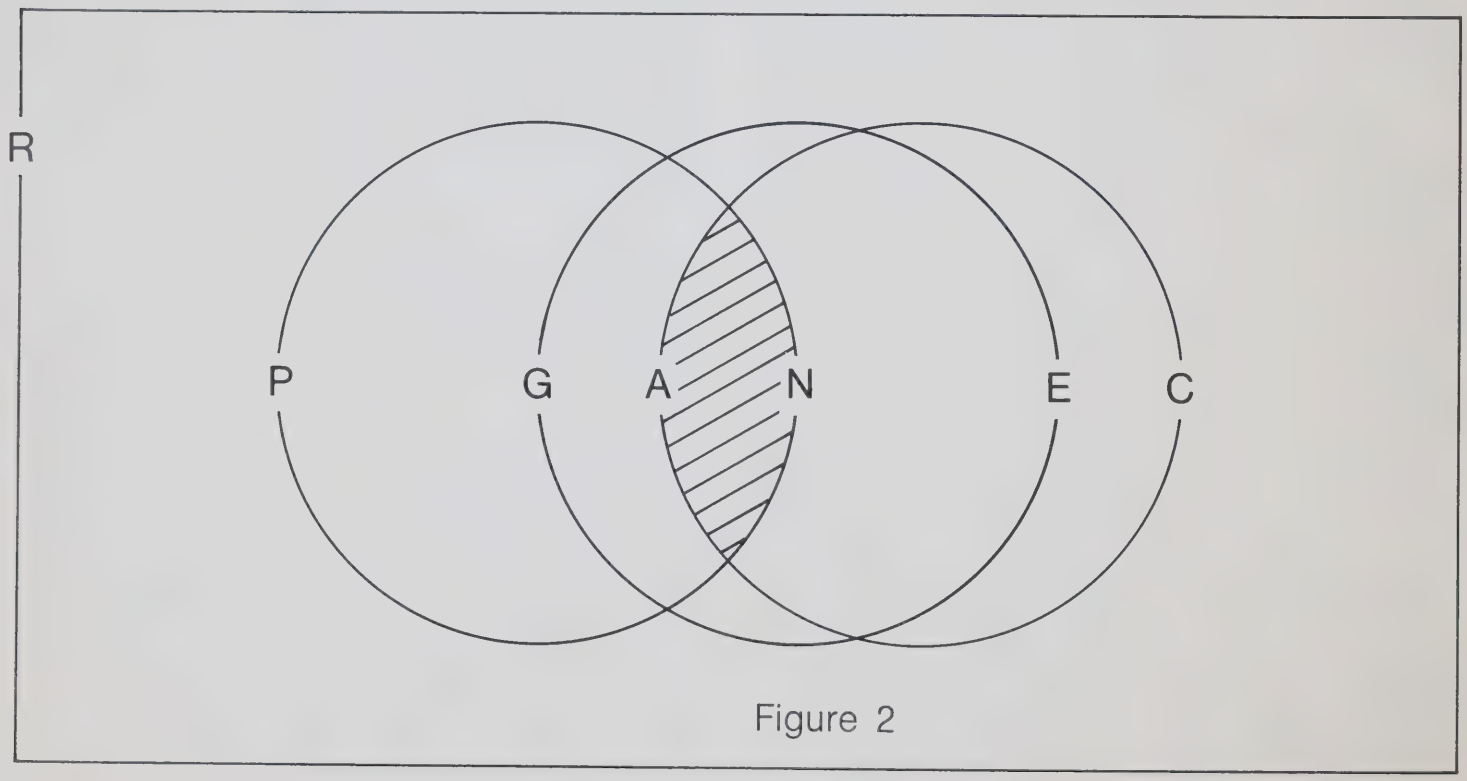


Figure 2

With the introduction of industrial activity and modern technology the cultural constraints are removed and more intensive use of the resource-base results. This is depicted in Figure 3 by an expanded AN area. The effect of this is to impose an imbalance on the resource processes which are naturally possible, PN, for example, the ability of moss to provide insulation to the permafrost zone. This in turn results in degradation of the resource-base, R, which in the analogy used might manifest itself in the development of thermokarst topography.

To illustrate empirically this point and the human implications of environmental degradation the case of the Indian settlement of Old Crow north of the Arctic circle in the Yukon Territory is discussed in the following section of this chapter.

OLD CROW FLATS — A CASE STUDY

The village of Old Crow is situated on the Porcupine River, a tributary of the Yukon River, at a point approximately 125 miles (200 kilometres) south of the Arctic Coast and 100 miles (160 kilometres) north of the Arctic circle.

The 150 inhabitants of Old Crow are Indians of the Vanta Kutchin tribe, "people of the lakes",[5] a subgroup of the Loucheux, whose ancestors lived for centuries along the Old Crow, Porcupine and Peel Rivers of the Yukon and Northwest Territories. The white man's early contact with the Loucheux of this area included Alexander Mackenzie in 1789 and trade with the Hudson's Bay Co. at Fort Good Hope, N.W.T. in 1814. The "Old Crow" Indians of the time traded caribou skins and dried fish for birch bark canoes made by Indians on the Black River where large birch trees were available.[6]

That the Old Crow area abounded in small game, caribou and fish was a fact known to the Indians of this part of the north long before the present village was established in 1912. The Old Crow Flats, a large area of

[5] Leechman, Douglas. *Vanta Kutchin, Bulletin No. 130, Anthropological Series No. 33.* National Museums of Canada, Ottawa.

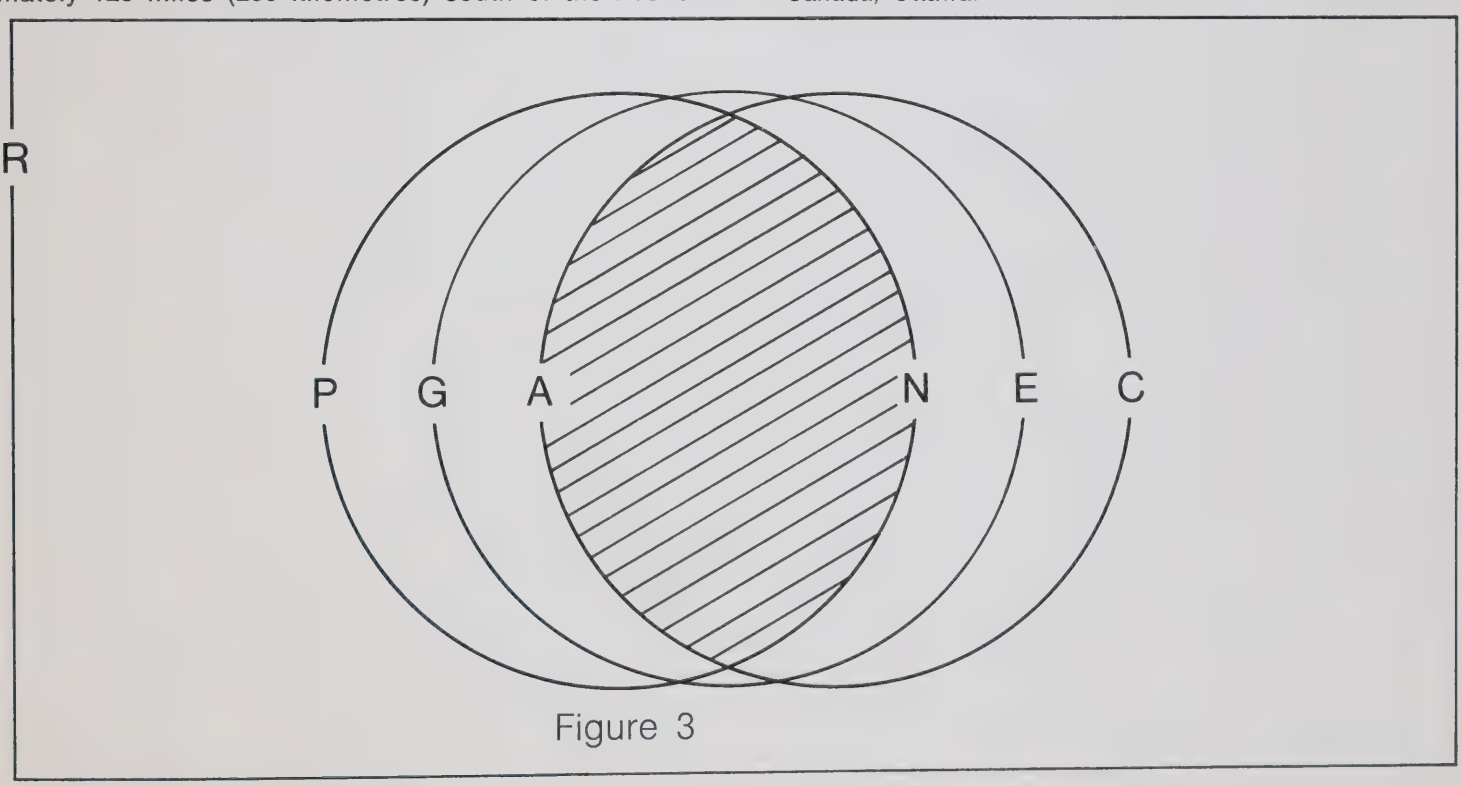


Figure 3

lakes and marshes, lies some fifty miles north of the Porcupine River and has proved a bountiful habitat for all manner of wildlife to many generations of Indians.

Hughes[7] described the Old Crow area in part as follows:

"Old Crow Plain (roughly 2,175 square miles — 5,570 square kilometres in area) occupies an elliptical basin bordered on the north by British Mountains, on the northwest by Davidson Mountains, on the southwest by Old Crow Range, and on the south and east by elements of Porcupine Plateau. Porcupine River, lying to the south, flows westward through a series of very similar but much smaller basins.

The surface of Old Crow Plain and of the smaller basins crossed by Porcupine River is an intricate mosaic of lakes and drained former lakes that range in age from 10,000 years to a few tens of years, with slightly elevated areas in between them. The elevated areas have a thick cover (up to 10 feet/3 metres) of sphagnum peat and living sphagnum with dwarf birch and scattered stunted spruce. Permafrost lies within one foot (30 centimetres) of the surface. Former lake areas drained a few hundred years or less are typically wet sedge meadow with sedge growing on organic layers.

The wettest parts especially may be unfrozen to several feet or tens of feet. The older drained lake surfaces have sedge peat cover with surface growth of mainly sedge. The thickness of the sedge peat is presumably greater the older the drainage of the lake. The oldest surfaces are in transition to sphagnum peat bog. Much of the sedge peat area has a polygonal network of ridges, with shallow water over the low centres of the polygons.

Underlying the surface organic cover is a thick sequence of basin-fill sediments, the uppermost unit of which consists of glaciolacustrine silt and clay with moderate to high content of segregated ice.

Old Crow River (which drains Old Crow Plain) and Porcupine River, have incised deep (up to 200 feet) rather broad valleys into the basin-fill sediments. Flood plains and low terraces that border the river are bounded by steep scarps that rise abruptly to the basin surface.

Sediments underlying the flood plains and terraces consist of silt 5 to 25 feet (1.5 to 7.5 metres) thick with organic layers and wood, overlying sand and gravel, also with organic layers and wood. The surface is typically mantled by peat 1 to 5 feet (30 to 150 centimetres) thick. The silts commonly contain much segregated ice in the form of ice wedges and irregular tabular bodies.

The flood plains and terraces bordering Old Crow and Porcupine Rivers and tributaries have well-developed meander-scar patterns, with stands of spruce on the slightly elevated ridges, and heavy willow growth in the depressions. The spruce attains diameters to 20 inches (50 centimetres)."

On the question of engineering considerations or what might be described as land surface disturbance, Hughes had this to say:

"Except under wet sedge meadows, lakes, and near certain south-facing bluffs, permafrost is near the surface throughout the area. *The permafrost melts to depths of several or tens of feet when the vegetation is disturbed.* In cutbanks along the main rivers and tributaries, the glaciolacustrine silt and clay at the top of the section thaws and flows, with backwalls of the slides extending several hundreds of feet (100 metres) back from the bluff face. Gulleys draining from the basin surface incise themselves rapidly into the frozen sediments and erode headward. This process tends to become self-limiting as the surface peat mat and vegetation fall into the gulley bottom and inhibit erosion. Nevertheless, natural headward erosion of gulleys has been responsible for complete drainage of numerous lakes bordering the main streams.

Disturbance of vegetation on scarp faces where seismic lines cross scarps could conceivably lead to gulley development and drainage of lakes if tracked vehicles or bulldozers were used in summer but such damage is highly unlikely in winter. Design of permanent installations (roads, pipelines, airstrips, etc.) on either the fluvial silts of the flood plains and terraces, or the glaciolacustrine deposits of the basins, must provide for complete preservation of the permafrost regimen."

[6] Ibid.

[7] Hughes, Owen L., *Geological Survey of Canada.* Calgary: (unpublished communication).

Table 1—Trapping Economy of Old Crow, Yukon Territory Number of Skins* and Total Value**

	1962	1963	1964	1965	1966	1967	1968	1969
Animal Type								
Number of Skins								
muskrat	12,361	17,411	14,000	7,860	9,688	13,324	11,273	9,461
marten	4	425	248	142	84	34	104	98
mink	19	165	70	14	18	4	8	29
beaver	26	13	37	19	45	98	47	—
lynx	2	4	17	17	19	12	—	8
other	35	221	135	41	40	39	67	58
Total Value Dollars	15,500	26,238	20,455	11,327	13,410	17,420	15,618	12,410

*Number of skins from Yukon Territory Game Department records.
**Value based on 1969 fur prices.

Failure to preserve the permafrost regimen could have significant social and economic consequences for the people of Old Crow. For generations the Old Crow Indian has, in a very real sense, lived off the land. Caribou, the main food item of the Vanta Kutchin, migrate annually through the region and cross the Porcupine River east of the village of Old Crow. In addition to the caribou, which also provide a source of clothing, the lakes and marshes of the Flats traditionally have been the trapping grounds of the Old Crow Indians (see Table 1) and have provided a significant source of revenue. The Porcupine River contains king salmon, and fishing rights, which have been allocated by the Indians in the settlement, are respected by all members of the community.[8] The white spruce referred to earlier is used extensively in the construction of log homes and other buildings and several hundred cunits (cunit equals 100 cubic feet or approximately 3 cubic metres) are cut annually for fuel wood.

It is estimated that an average of 500 caribou are taken each year for use in the village of Old Crow.[9] If the meat and skin of one caribou are evaluated at $100, (this is considered to be a conservative estimate), the average annual value of game harvested in the Old Crow area for the eight-year period 1962-69 is as follows: fur bearers, $16,500; caribou, $50,000; total value, $66,500.

On the basis of a hunting and trapping economy the average annual income accruing to Old Crow village is

[8] Leechman, D. *Bulletin No. 130.* Ottawa: National Museums of Canada.

[9] Source: Territorial Government Game Records, Whitehorse, Y.T.

approximately $70,000. Perhaps of equal importance is the fact that it represents a means of livelihood which is apparently satisfying to the individual. It is this sense of satisfaction with a particular way of life which presents the greatest difficulty in any significant attempt to quantify values. Furthermore, a basic fact which must not be overlooked is the security of knowing that such a means of obtaining a livelihood does exist, even if for a period it is not used: this is a matter of real value which must be classified as one of the perceptive needs of man to which I referred in Chapter I. It is at this point that the indigenous way of life and modern technology come into conflict.

In the situation where man lives in apparent harmony with the land's capacity to support him the regenerative capability of the land remains unimpaired. Conversely, disturbance of the natural environment as a result of technology calls for the introduction of a new element, *institutional conservation.* A regulatory mechanism is now required to reduce and in some instances eliminate alteration of the environment. First, however, it should be determined to what degree restrictions must be applied. If the permissible level of disturbance and the minimum level of damage at which it is still physically and economically feasible for the developer to operate are common, then the task of setting restrictions is relatively simple. It is only necessary to develop guidelines to define the manner in which this should be done.

However, the situation may be one where the degree of restriction required to maintain a traditional economy will result in significant increased costs to the industrial sector. In that case it will be necessary to determine the optimal degree of restriction by measuring the benefits to be derived as a result of reducing environmental disturbance, against the increased costs incurred by the private sector as a result of modifying its operation.

The problem cannot be easily resolved; the chief reason for this is the difficulty experienced in quantifying the benefits derived from reducing environmental disturbance. A geophysical exploration company operating in Old Crow Flats can readily determine the increase in costs as a result of increasingly restrictive measures imposed on its operations. But what about the benefits accruing as a result of such restrictions?

Continuing with the example of a geophysical operation in the Arctic, the problem can be shown schematically by considering marginal curves for costs of the private sector, and benefits to the public sector in terms of varying degrees of restriction of environmental regulations. As shown in Figure 4, marginal benefits tend to zero and marginal costs tend to infinity as the degree of restriction is increased. It might be argued that the application of regulatory restrictions should be at the point where MB = MC (Fig. 4).

In fact, the marginal cost curve is not smooth, but is irregular and consists of several steps based on well-defined operating procedures. Figure 5 illustrates the various inputs to the MC curve for seismic operation in the Mackenzie Delta, N.W.T. It can be seen that regulations prohibiting the use of wheeled vehicles and bulldozers increases the cost per mile by $450. If the proposed area of operation is particularly sensitive to disturbance the degree of restriction might include Step 3, thereby limiting operations to the use of helicopters for the transportation of all equipment. In these circumstances, costs would rise by $900 per mile.

Turning to the net benefits accruing to the local community from land-use three sources of income must be considered:

(a) geophysical exploration employment
(b) pipeline maintenance employment
(c) hunting and trapping.

Figure 4

Marginal benefits and costs of environmental regulations

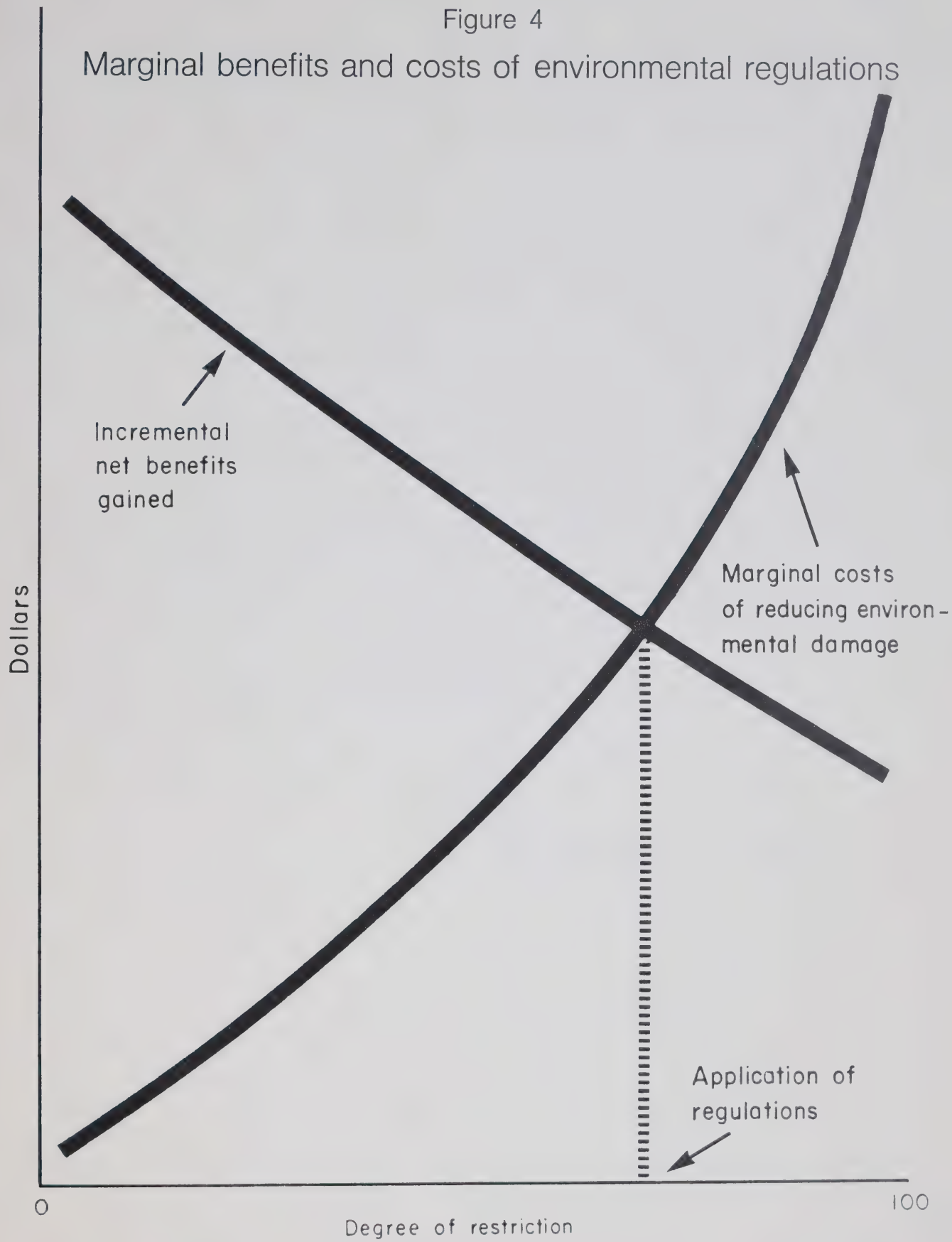
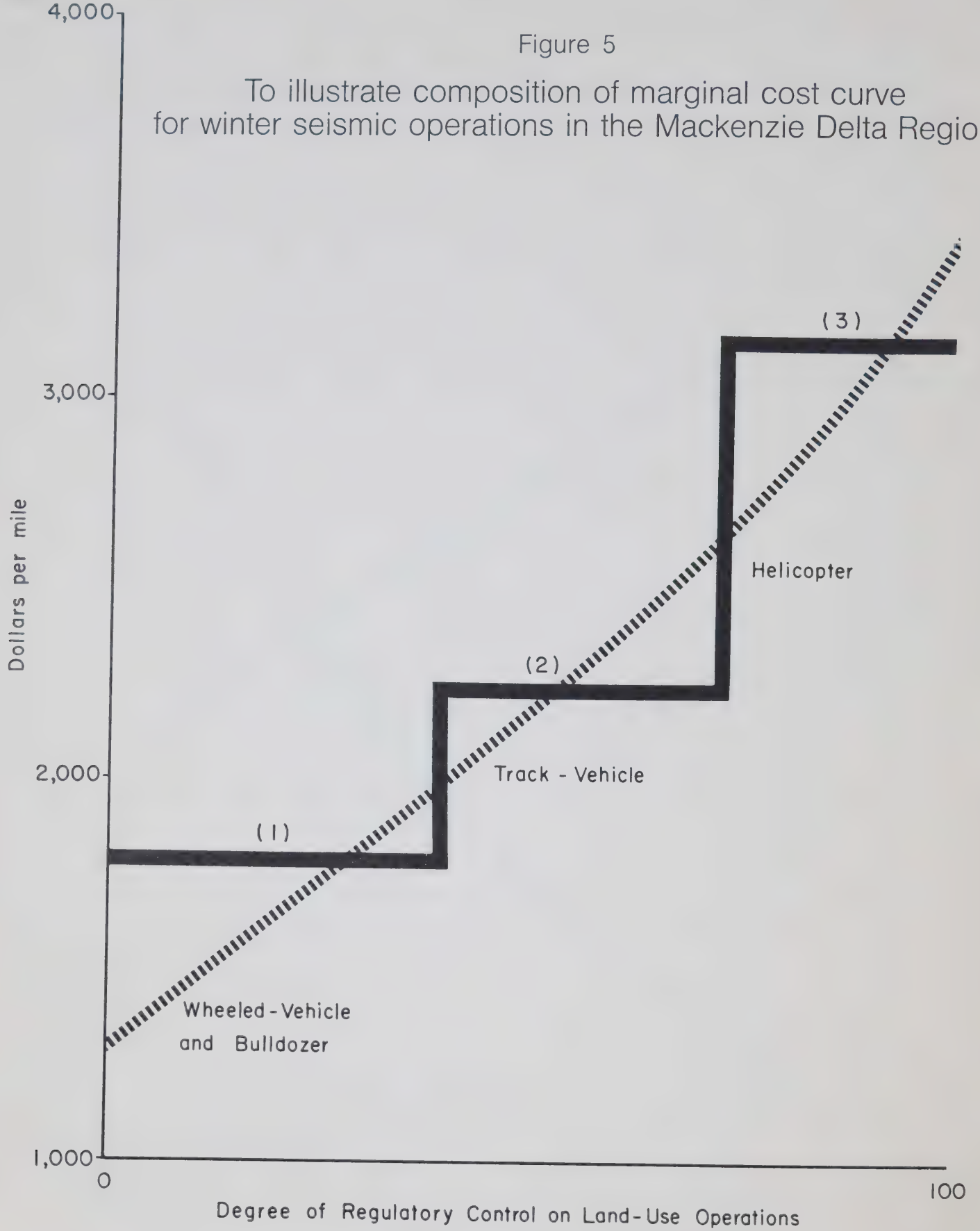


Figure 5

To illustrate composition of marginal cost curve
for winter seismic operations in the Mackenzie Delta Region



From discussions with geophysical exploration companies during the winter of 1970 it was learned that an average of 8 men from the Old Crow community could be employed regularly each year for about 5 months at $600 per month. Assuming that exploration work continued in the area for 5 years the total income available to the community from geophysical operations during that period would be $120,000. In other words, the value of the land to the Old Crow Indians in terms of exploration activity is $120,000. In Figure 6 this is represented by the line XX. As is illustrated increased regulatory control will not increase the benefits accruing to the community from such employment.

Assume that a pipeline, constructed to transport gas from the Arctic to southern markets, was located close enough to Old Crow to provide employment for some residents of the community. Based on discussions with pipeline companies it is estimated that in the maintenance of such a pipeline approximately 5 Old Crow Indians could be employed. At an annual wage of $7,000, this would represent a total income of $700,000 over a 20-year period (line X^1X^1 Fig. 6). Thus as a pipeline corridor and in terms of employment the value of the land to the Old Crow Indians would be $700,000. The value of the land in this instance, as with geophysical operations, would not increase with the application of more restrictive regulations.

When considering the land as wildlife habitat the situation is quite different. It was shown earlier that the average annual dollar income represented by the harvesting of caribou and fur bearers is approximately $70,000. Thus, on the basis of a hunting and trapping economy, the value of the land *provided its productive capacity is not impaired* could be assessed at $1,400,000 over the same 20-year period as used above. This is more than the value accruing to the local residents from the two industrial operations combined.[10]

Of particular importance here is the fact that, unlike the geophysical operations and pipeline maintenance, increasingly restrictive land-use regulations correspondingly increase the value of the land as wildlife habitat, as seen by the curve X^2X^2 in Figure 6. If no restrictions were imposed, resulting in the kind of disturbance to the land surface referred to by Hughes, the value of the land in terms of a hunting and trapping economy could be reduced to zero. On the other hand rigid regulatory control of land-use operations could maintain the value of the habitat at the full $1,400,000.

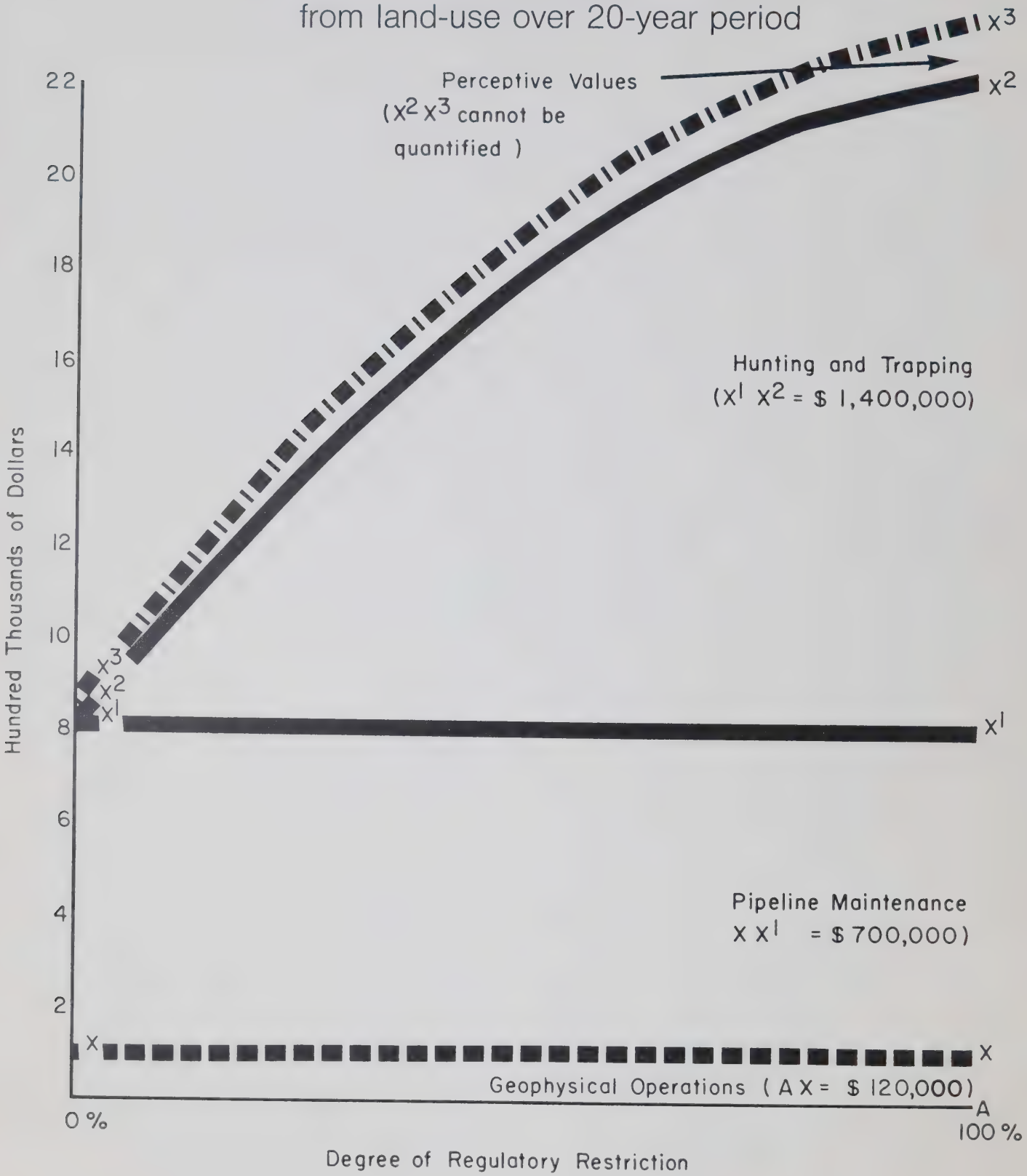
The incremental benefits resulting from more restrictive measures, hence changes in operating methods, become evident when the cost curve in Figure 5 is related to the total benefit curve in Figure 6.

Finally, the concept of *perceptive needs* must be considered here. The total value of the land, for example the Old Crow Flats, cannot be determined simply in terms of geophysical operations, pipelines or the bountiful wildlife habitat it represents. The indeterminate value of the Flats to the Indian lies simply in the knowledge that they do exist intact. The knowledge that he can go to the land whenever he wishes and, by exercising acumen and inherent ability, gain a livelihood in the tradition of his forefathers, unquestionably fills him with a sense of assurance and mental well-being to which no dollar value can be assigned. To give this concept tangible form I have described it as curve X^3X^3. The difficulty lies in determining the magnitude of X^2X^3.

[10] It can be argued here that this approach to the question of benefits is too parochial and that indeed much of the revenue that would accrue to the nation has not been recognized. For example, it is estimated that the revenue to the federal coffers from the sales tax on the 48-inch pipe and other materials would amount to $60,000,000. With the line in production an additional $45,000,000 would accrue annually to the federal government in the form of corporation taxes. If an oil pipeline was also constructed these figures would approximately double. Presumably these additional revenues would be reflected in increased benefits to all Canadians. Recognizing the validity of the argument I plead licence to pursue the basic concern of the community involved.

Figure 6

Potential benefits to village of Old Crow from land-use over 20-year period



TO LEND A BALANCE

"The new understanding of the universe has come about through the new knowledge amassed in the last hundred years — by psychologists, anthropologists and historians. It has defined man's responsibility and destiny — to be an agent for the rest of the world in the job of realizing its inherent potentialities as fully as possible. It is as if man had been suddenly appointed managing director of the biggest business of all, the business of evolution — appointed without being asked

if he wanted it, and without proper warning and preparation. What is more, he can't refuse the job. Whether he wants it or not, whether he is conscious of what he is doing or not, he is *in point of fact determining the future direction of evolution on this earth. That is his inescapable destiny, and the sooner he realizes it and starts believing in it, the better for all concerned.*

What the job really boils down to is this: the fullest realization of man's possibilities, whether by the individual, by the community, or by the species in its processional adventure along the corridors of time."

— Julian Huxley on "Transhumanism", 1955.

LEGISLATION

The type of regulatory control required to minimize damage to the land described in the preceding chapter was not possible given the legislation existing in 1969. The Territorial Lands Act (chapter 263 Revised Statutes of Canada 1952, as amended) provided authority for the disposition of Crown Land in the Territories through sale and surface leases but did not cover the required elements of protection and controlled use.

In view of this, an amendment to the Territorial Lands Act received first reading in the Spring of 1970. On June 22, 1970, it was passed by the House of Commons and on June 26, 1970, Bill C-212, an Act to amend the Territorial Lands Act received Royal Assent.

The purpose of the amendment is to provide a legislative base for the promulgation of regulations which will provide a measure of control over the types and methods of northern resource exploration, development and restoration procedures in order to minimize degradation of the land surface:

Section 18 (ia).

> make regulations respecting the protection, control and use of the surface of territorial lands.

In drafting the amendment it was recognized that existing mining, oil and gas, and timber regulations provided some control once the production phase was reached and the operation was being conducted on land leased under the original Act. However, during the exploration and development stages, prior to the issuance of a surface lease, no control mechanism existed. Indeed in order to cover the situation where exploratory and prospecting permits had already been issued (see Chapter II, Industrial Expansion) it was necessary to include in the amendment the following:

Section 27.

> Every licence, exploratory permit, prospector's licence, prospecting permit and mineral claim issued or recorded under the Canada Oil and Gas Land Regulations or the Canada Mining Regulations before the coming into force of this section shall, notwithstanding anything contained in those regulations, licences or permits, be subject to such regulations as may be made by the Governor in Council under section 3B or 18 of the Territorial Lands Act respecting the protection, control and use of the surface of territorial lands and applicable to the lands to which those licences, permits or mineral claims relate.

Because the lands in question cover an area of 1.5 million square miles and, as we saw earlier, include major variations in geological structures, climate and vegetation it is obvious that regulations pertinent to one area may not be sufficiently stringent in another or vice versa. For example, the degree of restriction applied to an operation on the rock desert of Ellesmere Island and the sub-Arctic forest tundra transition zone of the Old Crow Flats will be quite different. Thus in addition to the general regulations which will apply throughout, certain areas more sensitive to surface disturbance will be proclaimed "land management zones."

Section 3A.

> Where he deems it necessary for the protection of the ecological balance or physical characteristics of any area in the Yukon or the Northwest Territories, the Governor in Council may, after consultation with the Council of the Yukon Territory or the Council of the Northwest Territories . . . set apart and appropriate any territorial lands in that area as a land management zone.

Within a land management zone more stringent regulations can be applied depending on the nature of the operation and *no operation can be conducted without first applying for and receiving a land-use permit.*

Section 3B.

> The Governor in Council may, after consultation with the Council of the Yukon Territory or the Council of the Northwest Territories . . . make regulations respecting:
>
> (a) the protection, control and use of the surface of land in a land management zone; and
>
> (b) the issue of permits for the use of the surface of land in a land management zone, the terms and conditions of such permits and the fees therefor.

Dales'[1] comments on the contrast between the history of water and land use on the North American continent are pertinent to the question of fees referred

[1] Dales, J. H., "Land, Water and Ownership." *Canadian Journal of Economics,* November, 1968.

to in Section 3B(b) of the Act. He points out that rising land rents have been associated with phenomenal improvements in land-use technology; whereas zero rents for water have been associated with virtually zero improvements in water-use technology so far as quality-depleting uses are concerned.

Prior to passage of Bill C-212 public lands in the Territories when used during the exploration and development phases could be considered what Dales refers to as common-property ownership or property which can be used by everyone for almost any purpose at zero cost. In this respect it could be considered a free good analogous to air and water. Dales' warning regarding anything that is treated as a free good is that it will likely become a valueless thing.

By setting a fee in terms of X dollars per acre of actual land used within a land management zone, the public lands of the Territories will no longer be considered a free good by those companies conducting exploration and development operations. Presumably the application of a land rent, the provision in regulations for a guarantee deposit, and the liability for failure to comply under the following conditions . . .

Section 3C(1). Every person who

a) violates any regulations made pursuant to Section 3B, or
b) fails to comply with any terms or condition of a permit issued pursuant to such regulations is guilty of an offence and liable on summary conviction to a fine not exceeding five thousand dollars.

(2) Where an offence under subsection (1) is committed on more than one day or is continued for more than one day it shall be deemed to be a separate offence for each day on which the offence is committed . . .

will result in the development of improved technologies and ultimately the minimizing of land-surface degradation.

THE INSTRUMENTS OF MANAGEMENT

With the 1970 Amendments to the Territorial Lands Act the principle of *managed-use* was firmly embodied in legislation. The effectiveness of the principle is wholly dependent upon the way in which the instruments of management, that is the zones, the regulations, the permits and their accompanying stipulations, are developed and used. Two factors are central in establishing these mechanisms. They are:

a) that implicit in the whole program is the development of the resource-base and *use* of the land;[2]
b) that for any given area there may be more than one legitimate use and these uses may conflict.[3]

In developing a successful land-management program for this vast area several steps must be taken.

(a) The collection of available data and the designation of geographic areas which reflect various values of the land. Such areas would include those of:
  (i) economic and social significance to native peoples (e.g., hunting and trapping grounds)
  (ii) recreational and aesthetic value
  (iii) wildlife and wildlife habitat (e.g., breeding and nesting grounds)
  (iv) ecological uniqueness
  (v) historic, archaeological and scientific significance.

  All areas for each category are plotted on a separate transparency or overlay sheet.

  Obviously the success of this step is dependent upon the thoroughness of the consultation process. Each category requires discussion with quite different groups and must include the native people, the scientific and university community, and agencies in all levels of government.

(b) The preparation of maps depicting possible areas, and nature of future industrial activity based upon available data including forest inventory maps, geology and mineral occurrence maps, and maps of potential oil and gas lands.

(c) The identification of a series of geographic zones called Land-Management Zones. These zones are

[2] Thus the objective is one of minimizing disturbance to, not precluding use of, the land. The means to implement the latter is contained in Section 18(a) of the Territorial Lands Act which states that "The Governor in Council may upon setting forth the reasons for withdrawal in the order, order the withdrawal of any tract or tracts of Territorial lands from disposal under this Act;"

[3] Compared to the National Parks Act which provides for only one use of the land, namely recreation.

formed by superimposing the transparencies depicting land value areas (a) on the base maps showing region of industrial activity (b).

(d) For each Land-Management Zone the preparation of a "Surface-Sensitivity" map which in effect represents an inventory of the ecological characteristics of that zone. In part these maps are produced from airphoto interpretation of terrain conditions including consideration of such variables as topography, drainage, soil moisture conditions and vegetative cover. Three or four degrees of sensitivity are defined and the Land-Management Zone sub-divided into areas, coded as to sensitivity to disturbance, and mapped on overlays.

(e) The setting of a series of stipulations[4] for land-use operations. This is done by collating the transparency sheets in (d) with the Land-Management Zones (c) keeping in mind the specific factors for each zone as described in (a). The same kind of consultation is required here as in (a).

(f) The implementation of a research program to back up the regulatory program in order to appraise more accurately the actual extent and nature of damage to the land surface resulting from land-use operations. In this way stipulations that are either too permissive or too restrictive can be modified so that they will respond more accurately to the need. To this end the Water, Forests and Land Division began in 1969 the ALUR (Arctic Land-Use Research) program.[5]

SUMMARY AND CONSIDERATIONS

Before a complete legislative base can be developed a clear definition is required of what conservation really means. To bring the concept into sharp focus it should be related to the needs of mankind rather than simply to various natural elements. By doing so, four distinct phases of conservation emerge; managed use, restoration, protection and preservation. Problems which arise from the use of northern lands fall within the purview of all four phases, hence legislation designed to regulate industrial operations must be cognizant of *all* of man's needs.

The degree of restriction placed upon the private sector's industrial operations should be related to the possible benefits accruing to the public sector as a result of imposing various restrictions. Quantifying these benefits, which might include social, recreational, ecological or wildlife elements, is a task which should receive immediate attention.

The scientific community has reminded us with some regularity that Canada's Arctic and sub-Arctic environment is particularly sensitive to disturbance. Others have said that Canada's north is a vast storehouse of wealth which, if properly developed, will bring increased prosperity to northern residents.

One basic relationship has yet to enjoy full recognition. This is the balance which exists between man and the land. In spite of the apparent emptiness of the north there is considerable evidence that those who choose to gain a livelihood from the land are living close to its productive capacity. In this regard it is important to note that as with the Old Crow Indians, the income derived from traditional pursuits may be greater than that which can be derived from industrial operations. The objective then becomes one of developing a rational approach to land-use so that the introduction of technology will not impair the native peoples' ability to live in harmony with the land if that is their wish.

Finally there is the need to consider those other values of the land that are less easily defined.[6] A successful land-management program must recognize the perceptive needs of man. Irrespective of the success which may be attained in evaluating those elements listed above, the chance of quantifying perceptive values seems remote. Only through listening to the Indian and Eskimo people will the relationship between *man and the land in Canada's north* ever be understood.

[4] For an example of stipulations see Appendix C.

[5] Further discussion of ALUR can be found in Appendix D.

[6] "My children and their children must be able to go out onto the land if only for short periods to live with nature as their forefathers did." Roland Shingatok, Indian-Eskimo Association, Aklavik, N.W.T. Personal Communication.

APPENDIX A

EXCERPTS FROM AN ACT RESPECTING INLAND WATER RESOURCES IN THE YUKON TERRITORY AND NORTHWEST TERRITORIES.[1]

This Act was passed by the Canadian House of Commons on the 5th of May, 1970, during the 2nd Session, 28th Parliament and received Royal Assent June 26th, 1970.

INTERPRETATION

2. (d) "licence" means a licence for the use of waters issued pursuant to section 10.

(j) (1) "waste" means any substance that, if added to any waters, would degrade or alter or form part of a process of degradation or alteration of the quality in those waters to an extent that is detrimental to their use by man or by any animal, fish or plant that is useful to man, and

(11) any water that contains a substance in such a quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any waters, degrade or alter or form part of a process of degradation or alteration of the quality of those waters to an extent that is detrimental to their use by man or by any animal, fish or plant that is useful to man, and without limiting the generality of the foregoing, includes anything that, for the purposes of the Canada Water Act, is deemed to be waste;

(k) "water management area" means a river basin or other appropriate geographical area established as a water management area by the Governor in Council pursuant to paragraph (d) of section 26; and

(l) "waters" means waters in any river, stream, lake or other body of inland water on the surface or underground in the Yukon Territory and the Northwest Territories.

Waters Vested In Crown

3. (1) Subject to any rights, powers or privileges granted pursuant to the Dominion Water Power Act or preserved under that Act and to section 4 of this Act, the property in and the right to the use and flow of all waters are for all purposes vested in Her Majesty in right of Canada.

(2) Except as authorized pursuant to the Dominion Water Power Act or subsection (2) of section 39 of this Act, and subject to section 4 of this Act, no person shall alter or divert the flow or storage of waters within a water management area or otherwise use waters within any such area except pursuant to a licence held by him or except as authorized by regulations made pursuant to paragraph (g) of section 26.

Deposit Of Waste In Waters

6. (1) Except in accordance with the conditions of a licence or as authorized by the regulations, no person shall deposit or permit the deposit of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters.

Boards Established

7. (1) There shall be two boards to be known as the Yukon Territory Water Board and the Northwest Territories Water Board, each consisting of not less than three and not more than *nine* members appointed by the Minister.

Objects and Powers

9. The objects of the boards are to provide for the conservation, development and utilization of the water resources of the Yukon Territory and the Northwest Territories in a manner that will provide the optimum benefit therefrom for all Canadians and for the residents of the Yukon Territory and the Northwest Territories in particular.

Issue of licences

10. (1) Where an applicant for a licence satisfies the appropriate board that,

(iii) any waste that will be produced by the undertaking in association with the operation of which such waters will be used will be treated and disposed of in a manner that is appropriate for the maintenance of water quality standards prescribed pursuant to paragraph (e) of section 26, and

(iv) the financial responsibility of the applicant is adequate for the undertaking in association with the operation of which such waters will be used,

[1] Short title: Northern Inland Waters Act.

the board may, with the approval of the Minister, issue a licence to the applicant, for a term not exceeding twenty-five years, authorizing him, upon payment of water use fees prescribed pursuant to paragraph (a) of section 28 at the times and in the manner prescribed by the regulations, to use waters, in association with the operation of a particular undertaking described in the licence (hereinafter referred to as the "appurtenant undertaking") and in a quantity and at a rate not exceeding that specified in the licence.

Conditions of licence

(2) A board may attach to any licence issued by it any conditions that it considers appropriate including conditions relating to the manner of use of waters authorized to be used under the licence and conditions based upon water quality standards prescribed pursuant to paragraph (e) of section 26 relating to the quantity and types of waste that may be deposited in any waters by the licensee and the conditions under which any such waste may be so deposited.

Application for licence

11. (1) An application for a licence shall be in such form and shall contain such information as is prescribed by the regulations.

Information and studies to be provided to board

(2) The appropriate board shall require an applicant for a licence to provide it with such information and studies concerning the use of waters proposed by the applicant as will enable it to evaluate any qualitative and quantitative effects of the proposed use on the water management area in which the applicant proposes to use such waters.

26. The Governor in Council may make regulations

(a) setting forth the procedure to be followed on an application to a board for a licence, for the amendment or renewal of a licence or for authorization to assign a licence;

(b) setting forth information to be supplied to a board in connection with any application described in paragraph (a) and prescribing the form in which all or any of that information is to be submitted;

(c) prescribing forms in addition to any forms prescribed under paragraph (b) to be used in proceedings under this Act;

(d) on the recommendation of the Minister and the appropriate board, classifying uses of waters in the Yukon Territory and and the Northwest Territories, establishing water management areas consisting of river basins or other appropriate geographical areas and providing for the priorities among the classes of use of the waters within such water management areas;

(e) prescribing water quality standards for water management areas that are not, or are not included in whole or in part within, a water quality management area designated pursuant to the Canada Water Act;

(f) prescribing the quantities of waste, if any that may be deposited other than in accordance with the conditions of a licence in any waters or in any waters within a water management area, and prescribing the conditions under which any such waste may be so deposited;

Offences

32. (1) Any person who

(a) violates subsection (2) of section 3 or section 6, or

(b) being a licensee, uses waters in a quantity or at a rate in excess of, or for a purpose other than, that authorized under the licence held by him,

is guilty of an offence and liable on summary conviction to a fine not exceeding five thousand dollars.

(2) Where an offence under this section is committed on more than one day, it shall be deemed to be a separate offence for each day on which the offence is committed or continued.

APPENDIX B

EXCERPTS FROM AN ACT TO PREVENT POLLUTION OF AREAS OF THE ARCTIC WATERS ADJACENT TO THE MAINLAND AND ISLANDS OF THE CANADIAN ARCTIC[1]

This Act was passed by the Canadian House of Commons on the 9th of June, 1970, and received Royal Assent June 26, 1970.

INTERPRETATION

2. (h) "waste" means

(1) any substance that, if added to any waters, would degrade or alter or form part of a process of degradation or alteration of the quality of those waters to an extent that is detrimental to their use by man or by any animal, fish or plant that is useful to man, and

(11) any water that contains a substance in such a quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any waters, degrade or alter or form part of a process of degradation or alteration of the quality of those waters to an extent that is detrimental to their use by man or by any animal, fish or plant that is useful to man,

and without limiting the generality of the foregoing, includes anything that, for the purposes of the Canada Water Act, is deemed to be waste.

Application of Act

3. (1) Except where otherwise provided, this Act applies to the waters (in this Act referred to as the "arctic waters") adjacent to the mainland and islands of the Canadian arctic within the area enclosed by the sixtieth parallel of north latitude, the one hundred and forty-first meridian of longitude and a line measured seaward from the nearest Canadian land a distance of one hundred nautical miles; except that in the area between the islands of the Canadian arctic and Greenland, where the line of equidistance between the islands of the Canadian arctic and Greenland is less than one hundred nautical miles from the nearest Canadian land, there shall be substituted for the line measured seaward one hundred nautical miles from the nearest Canadian land such line of equidistance.

(2) For greater certainly, the expression "arctic waters" in this Act includes all waters described in subsection (1) and, as this Act applies to or in respect of any person described in paragraph (a) of subsection (1) of section 6, all waters adjacent thereto lying north of the sixtieth parallel of north latitude, the natural resources of whose subjacent submarine areas Her Majesty in right of Canada has the right to dispose of or exploit, whether the waters so described or such adjacent waters are in a frozen or a liquid state, but does not include inland waters.

Deposit of Waste

4. (1) Except as authorized by regulations made under this section, no person or ship shall deposit or permit the deposit of waste of any type in the arctic waters or in any place on the mainland or islands of the Canadian arctic under any conditions where such waste or any other waste that results from the deposit of such waste may enter the arctic waters.

Regulations

(3) The Governor in Council may make regulations for the purposes of this section prescribing the type and quantity of waste, if any, that may be deposited by any person or ship in the arctic waters or in any place on the mainland or islands of the Canadian arctic under any conditions where such waste or any other waste that results from the deposit of such waste may enter the arctic waters, and prescribing the conditions under which any such waste may be so deposited.

Civil liability resulting from deposit of waste

6. (1) The following persons, namely:

(a) any person who is engaged in exploring for, developing or exploiting any natural resource on any land adjacent to the arctic waters or in any submarine area subjacent to the arctic waters,

[1] Short title: Arctic Waters Pollution Act.

(b) any person who carries on any undertaking on the mainland or islands of the Canadian arctic or in the arctic waters, and

(c) the owner of any ship that navigates within the arctic waters and the owner or owners of the cargo of any such ship,

are respectively liable and, in the case of the owner or a ship and the owner or owners of the cargo thereof, are jointly and severally liable, up to the amount determined in the manner provided by regulations made under section 9 in respect of the activity or undertaking so engaged in or carried on or in respect of that ship, as the case may be,

(d) for all costs and expenses of and incidental to the taking of action described in subsection (2) on the direction of the Governor in Council, and

(e) for all actual loss or damage incurred by other persons

resulting from any deposit of waste described in subsection (1) of section 4 that is caused by or is otherwise attributable to that activity or undertaking or that ship, as the case may be.

Prescription of shipping safety control zones

(1) Subject to subsection (2), the Governor in Council may, by order, prescribe as a shipping safety control zone any area of the arctic waters specified in the order, and may, as he deems necessary, amend any such area.

(2) A copy of each order that the Governor in Council proposes to make under subsection (1) shall be published in the Canada Gazette; and no order may be made by the Governor in Council under subsection (1) based upon any such proposal except after the expiration of sixty days following publication of the proposal in the Canada Gazette.

Regulations relating to navigation in shipping safety control zones

12. (1) The Governor in Council may make regulations applicable to ships of any class or classes specified therein, prohibiting any ship of that class or of any of those classes from navigating within any shipping safety control zone specified therein

(a) unless the ship complies with standards prescribed by the regulations relating to

(i) hull and fuel tank construction, including the strength of materials used therein, the use of double hulls and the subdivision thereof into water-tight compartments,

(ii) the construction of machinery and equipment and the electronic and other navigational aids and equipment and telecommunications equipment to be carried and the manner and frequency of maintenance thereof,

(iii) the nature and construction of propelling power and appliances and fittings for steering and stabilizing,

(iv) the manning of the ship, including the number of navigating and lookout personnel to be carried who are qualified in a manner prescribed by the regulations,

(v) with respect to any type of cargo to be carried, the maximum quantity thereof that may be carried, the method of stowage thereof and the nature or type and quantity of supplies and equipment to be carried for use in repairing or remedying any condition that may result from the deposit of any such cargo in the arctic waters,

(vi) the freeboard to be allowed and the marking of load lines,

(vii) quantities of fuel, water and other supplies to be carried, and

(viii) the maps, charts, tide tables and any other documents or publications relating to navigation in the arctic waters to be carried;

(b) without the aid of a pilot, or of an ice navigator who is qualified in a manner prescribed by the regulations, at any time or during any period or periods of the year, if any, specified in the regulations, or without icebreaker assistance of a kind prescribed by the regulations; and

(c) during any period or periods of the year, if any, specified in the regulations or when ice conditions of a kind specified in the regulations exist in that zone.

Offences

Deposit of waste by persons or ships

18. (1) Any person who violates subsection (1) of section 4 and any ship that violates that subsection is guilty of an offence and liable on summary conviction to a fine not exceeding, in the case of a person, five thousand dollars, and in the case of a ship, one hundred thousand dollars.

Continuing offences

(2) Where an offence is committed by a person under subsection (1) on more than one day or is continued by him for more than one day, it shall be deemed to be a separate offence for each day on which the offence is committed or continued.

APPENDIX C

AN ILLUSTRATION OF STIPULATIONS

In addition to the general regulations, each permit issued for a land-use operation within a land management zone will have attached to it a series of specific terms applicable to that operation. If, for example, a winter geophysical operation to be conducted is in an area which supports a local hunting and trapping economy, the following additional stipulations might be added to the permit.

1. In order to guarantee the observance of the operating conditions set out in the permit, the Company will deliver a performance bond, in the amount of $100,000 to the Department in a form satisfactory to the Minister.
2. The Company will forward the sum of eight hundred and fifty dollars ($850) on the last day of each month in which geophysical operations are carried out. These funds shall be in the form of a certified cheque made payable to the Local Trappers Association trust account and should be forwarded for deposit to the local bank. The Account will be used for the purpose of paying the wages of trappers immediately following their assignment to the exploration crew to monitor the geophysical operation and advise game officers on matters pertaining to the protection of wildlife. The area administrator, will administer these funds and will withdraw from time to time appropriate sums for disbursement to the trappers involved. A record of account concerning the disbursement of funds for services provided will be maintained and will be forwarded to the Company from time to time, and a final accounting will be made following the current phase of operations and any balance of funds will be returned to the Company.
3. The Company will provide free transportation, board and lodging to trappers and game officers assigned to its exploration crews for purposes of monitoring and advising on the conduct of the geophysical operation.
4. Prior to commencement of operations, the Company will obtain the approval of the Regional Director, Canadian Wildlife Service to commence and carry out operations within migratory bird sanctuaries in the permit area.
5. Land Clearing Operations and Stream Crossings

(a) All bulldozer blades shall be equipped with "mushroom" type shoes which shall at all times be extended a minimum distance of six (6) inches below the cutting edge of the bulldozer blade unless otherwise authorized by the inspector.

(b) The operator shall so locate crossings of lakes, rivers, streams and gullies as to avoid, where possible, the excavation of approaches, shores, banks, streams and channel beds and, notwithstanding the foregoing, no excavations shall be made by the operator without the prior approval of the inspector.

(c) Debris deposited in any gulley, lake, river or stream shall be removed by the operator at a time and in a manner satisfactory to the inspector.

(d) Scarring of the ground surface and removal of surface vegetation are prohibited and no cuts or fills shall be made by the operator without the prior approval of the inspector.

6. Wildlife

(a) The operator shall not use machinery or otherwise conduct the geophysical operation so as to harass or unnecessarily disturb wildlife or damage wildlife habitat.

(b) The operator shall agree to abide at all times with the instructions of game officials with respect to any matters pertaining to the protection of wildlife and wildlife habitat.

7. Damage to Works

(a) If the operator causes damage to any property, works, structure or facilities including traps, trapping equipment, during the geophysical operation, he shall:

(i) immediately take action to prevent further damage;

(ii) immediately inform the owner, or the inspector or game official of the place and nature of the damage; and

(iii) arrange for the repair of such damage or the replacement of the damaged works as soon as it is possible to do so.

(b) When the operator fails to comply with (a) above, the Director may cause such action to be taken as to ensure repair of the damage or replacement of the damaged works and the costs thereof may be received from the operator as a debt due to the Crown.

APPENDIX D

ARCTIC LAND-USE RESEARCH PROGRAM (ALUR)

In the course of developing land-use regulations and through discussions with the oil and gas industry, the mining industry, conservation groups and various government agencies it was evident that few data relating to the effects of man-made disturbance to northern lands were available. Thus ALUR was established to provide a scientific base for the setting of land-use regulations and pursuant stipulations. The terms of reference for ALUR are as follows:

1. To detect and define environmental problems associated with northern resource development and particularly those problems associated with land-use operations used in the exploration and development phase of resource exploitation in the far north.
2. To compile base line information, where available, on undisturbed northern ecosystems for use as control data in measuring the environmental effects of land-use operations.
3. To devise and test alternative resource exploration and development operating procedures where it is found that present procedures result in unacceptable levels of damage to the land surface.
4. To make recommendations on the basis of data obtained from the research program, respecting the type and degree of restrictions to be imposed on northern land use operations in various areas or zones of northern Canada.
5. To publish and disseminate data respecting northern land use operations to:
   (i) resource exploration industries;
   (ii) interested government departments; and
   (iii) universities and the scientific community in general.

An advisory board, similar to the one formed to aid the government in drafting the Land-Use Regulations, was established to set in motion and provide direction to the ALUR program. The board, consisting of representatives of the petroleum industry, the mining industry, conservation groups, Canadian universities, and the Department of Indian Affairs and Northern Development, is responsible for identifying problems, with respect to land and fresh water, resulting from industrial activity and describing the kinds of research necessary to deal with these problems. This advisory board, so constituted, has proved extremely successful in bringing considerable expertise from various and diverse sectors to bear upon a single program and, almost of equal importance, has resulted in better utilization of research resources throughout industry, university and government.

The university community in carrying out the actual research, works on a contractual basis, to specific terms of reference and time schedules. This is not to say that it has replaced the traditional 'grants' type research which, of course, must be continued and increased. It is interesting to note that many of the ALUR researchers received at least part of their early training through the Department's grants program. In 1970 seven Canadian universities participated in the ALUR program.

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